

WHAT IS CLAIMED IS:

1. A plasma processing apparatus generating plasma under atmospheric pressure for processing an object, comprising:

first and second electrodes adjacent to each other and having coated surfaces facing a surface of the object to be processed;

5 a dielectric having a first opposing surface positioned spaced apart from the surface of the object between the object and said first electrode and a second opposing surface positioned spaced apart from the surface of the object between the object and said second electrode, filled between said first and second electrodes and covering said coated surfaces;

10 gas supplying means having a supply opening formed on said first opposing surface for supplying a processing gas to the surface of the object through said supply opening; and

15 gas exhausting means having an exhaust opening formed on said second opposing surface for exhausting the processing gas supplied to the surface of the object through said exhaust opening.

2. The plasma processing apparatus according to claim 1, wherein said gas supplying means is provided inside said first electrode, and said gas exhausting means is provided inside said second electrode.

3. The plasma processing apparatus according to claim 2, wherein around said gas supplying means and said gas exhausting means, an inner wall formed of a dielectric material is provided.

4. The plasma processing apparatus according to claim 1, wherein the coated surfaces of said first and second electrodes, respectively, extend on a plane parallel to the surface of the object.

5. The plasma processing apparatus according to claim 1, wherein an electric line of force connecting said first and second electrodes when a voltage is applied between said first and second electrodes extends

above and substantially parallel to the surface of the object.

6. The plasma processing apparatus according to claim 1, wherein said supply opening and said exhaust opening are provided in a vicinity of a region positioned between said first opposing surface and said second opposing surface.

7. The plasma processing apparatus according to claim 1, wherein said dielectric includes a recessed portion formed such that distance from the surface of the object to said second opposing surface is made larger than distance from the surface of the object to said first opposing surface.

8. The plasma processing apparatus according to claim 1, wherein said supply opening and said exhaust opening are formed to have a slit-shape extending in one direction or formed as a plurality of pores arranged in one direction.

9. The plasma processing apparatus according to claim 1, wherein said gas supplying means and said gas exhausting means are formed such that total flow rate of gas exhausted through said exhaust opening is not smaller than total flow rate of the processing gas supplied through said supply opening.

10. The plasma processing apparatus according to claim 1, wherein at that portion of said dielectric which faces the surface of the object, where distance between an end portion of said dielectric positioned at a shortest distance from said supply opening and said supply opening is represented by L1, distance between said supply opening and said exhaust opening is represented by L2, and distance between said exhaust opening and an end portion of said dielectric positioned at a shortest distance from said exhaust opening is represented by L3, L1, L2 and L3 satisfy the relations of  $4 \leq L1/L2 \leq 1000$  and  $4 \leq L3/L2 \leq 1000$ .

11. The plasma processing apparatus according to claim 1, further comprising

a grounded conductive cover provided to cover externally exposed surfaces of said first and second electrodes.

12. The plasma processing apparatus according to claim 1, further comprising

a third electrode positioned next to said second electrode on a side opposite to said first electrode with respect to said second electrode,

5        said apparatus being formed in symmetry with respect to said second electrode.